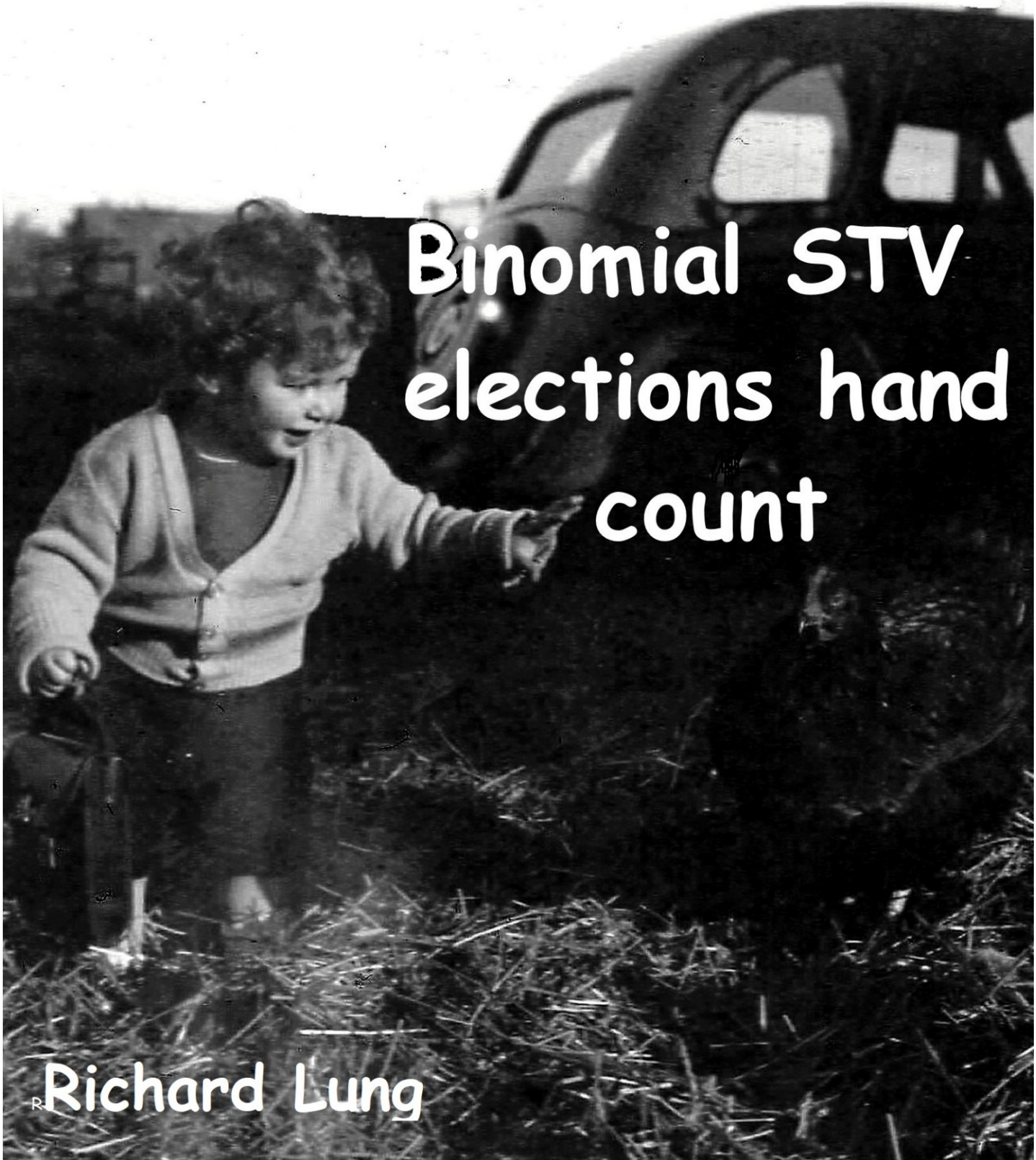
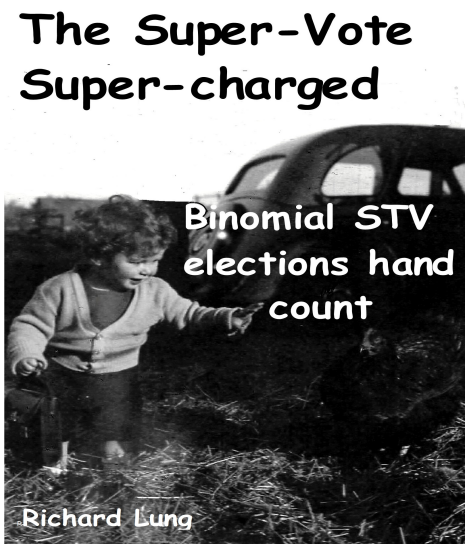
The Super-Vote Super-charged



Binomial STV elections hand count

Richard Lung



The Super-Vote super-charged: Binomial STV elections hand count

Copyright © 2021: Richard Lung.
First edition.

Table of Contents

Introduction

Principles of a hand count of the binomial single transferable vote

A preference vote

A binomial count

Count symmetry

Transferable voting:
sharing ones vote between prefered candidates

The keep value

Worked example of Binomial STV

The voters preferences

Binomial STV election count

Binomial STV exclusion count

Over-all candidate keep values

Keep value determinacy rule

Reference: FAB STV

Introduction

An axiom of science is that there is only one truth to aspire to. All election methods are actually not just elections but also exclusions. And the ways to elect and exclude candidates are all counted differently, as if there were two truths to representing voters. Therefore, the worlds voting systems must be false. Indeed, they are rendered obsolete by an election method that counts elections and exclusions, in the same way. Binomial STV does this. It is a bi-nomial count of both elections and exclusions.

The single transferable vote was called the super-vote, by Joe Rogalay, in his book, Parliament For The People. Binomial STV is the super-vote super-charged.

When I was a member of the Electoral Reform Society, in the 1970s, the secretary and charge of ballot services (since sold off) was Maj Frank S Britton MBE (military). He co-wrote, with Robert A Newland, the pamphlet, “How to conduct an election by the single transferable vote.” Frank sent me an initialed copy.

His great experience, of counting STV, told him that the Droop quota did not need to be:

{(votes)/(seats + 1)} + 1. The final plus one is never necessary. The Droop quota can be just:

{(votes)/(seats + 1).

This is worth mentioning, because, over 40 years later, many texts have not caught up with this fact.

In 2018, urged by Steve Todd, who helped introduce Meek method STV to New Zealand, I wrote the e-book, FAB STV: Four Averages Binomial Single Transferable Vote.
FAB STV is the whole logical structure to binomial STV. It has great representative potential, beyond elections, as a data retrieval algorithm. However, I realise, now, that, for learning purposes, it is rather like having a non-swimmer jumping in at the deep end of the pool.

In 2021, Gareth Lewis suggested the four averages were a distraction, and asked if a hand count of Binomial STV was possible.

My immediate reaction was: No way!

But I thought about it, and realised it was possible, after all. That is because Binomial STV can use the traditional hand count of surplus vote transfers. This has over a century of reliable use. Hand count STV does not have to go to Meek method standards of transfer accuracy.
In contrast, the simple plurality count (first past the post) stops after the count of only one preference, the X-vote. For most purposes, FPTP is a grossly inaccurate approximation.

Binomial STV gives exclusion, as well as election, a rational count, in its own right. Candidates are not merely excluded, when the surplus votes run out, as in traditional STV counts. In my opinion, they are a clumsy expedient.
Funnily, I never thought of a hand count binomial STV option, until Gareth Lewis took an interest!

Principles of a hand count of the binomial single transferable vote

Table of contents

A preference vote

Voters have a preference vote, for all the candidates, in order of their choice.

The big difference, from other preference voting, is that, with binomial STV, the last preference counts just as much to exclude a candidate, as the first preference counts to elect a candidate. And this is true, in their degree, of successive orders of preference, compared to successive orders of unpreference.

A binomial count

Binomial STV departs from all traditional STV count practice of excluding candidates when the surplus votes run out.

Instead, Bi-nomial STV is in two parts: An election count followed by an exclusion count. The counts are then averaged to give a more representative over-all result, which is expressed in terms of keep values.

Count symmetry

In keeping with the scientific axiom that there is only one truth, the exclusion count, of reversed preferences or unpreferences, is counted in the same way as the election count of preferences. This may be called the count symmetry requirement for true elections.

Hence, both election count and exclusion count use the same quota, or elective proportion of votes. The transfering of votes is also calculated in the same way.

Transferable voting:
sharing ones vote between prefered candidates

The size of any surplus votes, a candidate wins over the quota, determines their surplus value. The surplus weights a transfer value, which is a fractional share of the surplus vote, assigned each next preference, from all that candidates voters.

This so-called total transferable vote, of the elected candidate, is divided into the quota, to determine the keep value.

The keep value

The keep value is the proportion of the vote that a candidate keeps, during the count. The keep value plus the transfer value equals one vote. This is in accord with the democratic equality of one person, one vote.

If the candidates vote exactly equals the quota, this means a keep value of unity. The candidate is just elected but has no surplus to transfer.

As a candidate receives more preferences, these decrease the size of the keep value, and increase the value of the transfer value.

Meek method only gives the keep values of candidates in surplus of a quota. Binomial STV gives keep values to all candidates, making possible a standard of comparative popularity between all the candidates. Keep values, of candidates in deficit of a quota, are greater than unity.

Worked example of Binomial STV

Table of contents

This example is from my book, FAB STV: Four Averages Binomial Single Transferable Vote. This election was an actual contest that took place between 21 candidates for 5 seats. This time, only one of the four averages, in FAB STV, is used. The geometric mean is the one average necessary to make Binomial STV possible.

I have not even used my own invention of the Harmonic Mean quota, the average of Hare and Droop quotas, by taking their harmonic mean. Instead, I have used the Droop quota, the quota, that has superseded the Hare quota, for STV, in modern times. The original intention of Thomas Hare was to use large constituencies, for which the Hare quota is suitable. But the Droop quota is necessary for smaller constituencies.

The true reason for this supersession is not that the Droop quota is inherently more logical or justifiable than the Hare quota. It is just the history of politicians intolerance of more competitive elections using large constituencies.

In FAB STV, I take the average of the Hare and Droop quotas, which is my invention of the Harmonic Mean quota. However, my reversion of the quota level (from HM to Droop) only lowers the bar of election for all candidates. It does not alter the relative positions of the candidates.
Whereas, conventional STV has logical flaw, that altering the quota level may alter the contest result, by altering when the surplus votes run out, possibly to exclude or eliminate a different candidate, who has least votes at that stage, for transfer to his voters distinct next preferences.

Binomial STV abandons the traditional STV practice, including in Meek method, of an ad hoc exclusion of candidates when the surpluses run out. Instead, binomial STV makes the exclusion count just like a fully rational election count, but with the preferences reversed, which is to say an unpreference order.

Below, I use the same example, as in my book for the full FAB STV. There are only 10 voters, from which one could not infer much of a voting pattern. The count of such a small number is mostly useful as an exercise in a new procedure. The 10 voters all expressed different permutations of choice for all 21 candidates. There are factorial twenty-one possible permutations of choice, which is a big number! Had even two voters shared the same order of 21 choices, one would suspect -- know -- that they had agreed a common slate, before casting their preference votes.

The voters preferences

Table of contents

Table 1 shows the 10 voters orders of 21 choices. For the election count, the order of choice reads from left to right. For instance, in permutation row 1, the first choice is A, second choice K, and so on, till the last choice, number 21, which is H. All 10 voters express this, on their ballot papers, by numbering their orders of choice from 1, 2, 3, ... to 21.

The exclusion count, by Binomial Single Transferable Vote, makes use of the reverse order of choices, reading right to left, from last preference to next last, 21, 20, 19, ...

The quota, for the election count and the exclusion count, is the same. The two counts are conducted the same way, just with the preferences reversed. The use of the same counts is an important first principle or axiom of voting methods. It is axiomatic to science, that there is only one truth, to aspire to. Therefore, hybrid electoral systems, or any voting method, using more than one counting method, must be false.

In this example, we are using the Droop quota, which equals: (votes)/(seats + 1) = 10/(5 + 1) = 1.667.

STV^ is the short-hand for binomial STV, without specifying how many orders of count are taken, one or more. (Higher order counts, needing a computer, are explained in my book FAB STV:…) Even first-order binomial STV, or STV^1, uses both an election (of preferences) table and an exclusion (of unpreferences) table. Hence the term, bi-nomial, for two terms to count.

Symbolising election by the letter L, and exclusion by the letter X, then first order binomial STV would go by the simplest formula of the binomial theorem: (L + X), which is short for (L + X)^1. "First order" means "to the power of one." (Full explanation can be found in my book, FAB STV:...)

I repeat, larger numbers of voters, than the below example, are really needed to draw realistic conclusions about voters preferences for candidates. Very small numbers of voters tend not to have any significant pattern of distribution, which a highly rational system of election, like STV, depends on, to ensure large proportions of the vote are transferable, for a clear-cut result.

Binomial STV starts, like conventional STV, with an election quota and the transfer of surplus votes, over the quota, to help elect next prefered candidates. When this source of election runs out, conventional STV (but not binomial STV) merely excludes the candidate, unfortunate enough to be currently last past the post.

The numbers 1 to 10, in the first column of table 1, have nothing to do with the voters order of choice. They are there for the benefit of the returning officer, in a manual count, to show which number permutation row directs any transfer of votes.

Binomial STV table 1:
10 voters permutations on 21 candidates.

1	A	K	E	B	R	F	L	I	N	P	T	Q	J	M	O	D	C	S	U	G	H
2	B	E	R	A	O	C	N	F	I	P	L	D	K	Q	G	S	T	U	J	H	M
3	O	G	F	S	C	M	A	K	B	T	L	R	E	H	P	J	D	I	N	U	Q
4	G	K	D	M	P	R	Q	A	F	H	L	N	S	U	B	I	C	J	O	T	E
5	H	I	B	Q	E	O	M	F	R	A	K	N	P	C	L	U	S	T	D	J	G
6	A	F	G	I	M	T	C	E	H	K	U	D	N	O	P	Q	B	L	J	R	S
7	O	M	H	P	B	K	A	N	Q	I	C	J	F	L	R	S	U	T	D	E	G
8	L	G	F	O	A	C	M	J	E	N	S	K	R	D	Q	P	B	I	T	H	U
9	K	H	B	J	A	T	I	E	O	N	C	D	L	M	R	Q	G	U	P	S	F
10	K	B	E	T	N	I	A	H	C	M	F	P	R	U	J	L	G	D	O	Q	S

The returning officer starts a manual count of first order Binomial STV (STV^1) by counting the total number of votes and counting the number of first preferences, for each candidate, shown in the first column, next to the column, of letters for candidates, on the left of table 1.

The first set of vote transfers are: On perm 1, A to K. On perm 6, A to F. On perm 9, K to H. On perm 10, K to B. On perm 3, O to G. On perm 7, O to M. The numbers of votes for the candidates, after these transfers, is recorded in table 2, column 2.

Three candidates, A, K, O each have 2 votes, which are enough to elect them, being over the elective quota of 10/(5 + 1) = 1.667 votes (to three decimal places).The surplus vote is transfered at a transfer value of: (2-1.667)/2 = 0.166 (rounded down to three decimal places). This weight of transfer value is assigned to each of the next preferences of the six voters, who gave two votes each to A, K and O. In this case, all six second preference candidates each receive 0.166 of a vote. This is recorded in table 2, col. 2.

Binomial STV election count

Table of contents

Next, Table 2 shows both the similarity and difference of (first-order) binomial STV from a traditional STV count. The similarity is that once a candidate has been elected, on a quota, or more, of the votes, no further preferences for that candidate are added.
Meek method does keep on adding the preferences to an already elected candidate. This gives a more accurate tally of the elected candidates eventual keep value. But that requires a computer count. And to make binomial STV practical as a hand count, I have to go back to the traditional STV count, which is simpler but somewhat less accurate.
However, the history of STV hand counts, for over a century, suggests this is not too serious a simplification.

Election counts are based on the democratic principle of one person one vote. Transferable voting allows voters to split their votes into fractions for various candidates, according to their order of preference. Transfers do not take place, until the previously prefered candidate has achieved a quota.

Hence, the keep value, for an elected candidate, surpassing the quota, combines with the transfer value, to equal the one vote, to which every voter is entitled.

In this example, the transfer value is: total transferable vote minus (the quota, divided by the total transferable vote), which equals, in this example: (2-1.667)/2 =1 - 0.833 = 0.166 weight per next prefered candidate.

Table 2: STV Election Quota = 10/(5+1) = 1.667.

Cand-idate	(1) First prefs. elect A, K, O.	(2) Transfer surplus of A, K, O, all @ 0.166	(3) Election keep values @ quota/ (total transfer-able vote)
A	2	1.667	0.833
B	1	1.166	1.430
C			
D			
E		0.166	10.042
F		0.166	10.042
G	1	1.166	1.430
H	1	1.166	1.430
I			
J			
K	2	1.667	0.833
L	1	1	1.667
M		0.166	10.042
N			
O	2	1.667	0.833
P			
Q			
R			
S			
T			
U			

NOTA*			
Votes	10	10	

*NOTA: None Of The Above. This example of table 1 has no blank preferences. But blank preferences, in elections, add up to the quota for an unfilled seat. This creates an often much-needed incentive for better candidates to fill all the seats.

Both in table 2 and table 3, the last rows of column (1) and (2) are error checks that the votes still total to 10, after the vote transfers.

A conventional STV election (appended in my book FAB STV...) would show A, K, O and G elected, followed by a tie for fifth place. B or H, would have to be elected randomly to the fifth vacancy. I'm told that using a computer count by Meek method on this example, H beats B. I was also told by the same expert that candidates A, K, O, G, H always win against any other candidate who may form a sextet of candidates competing for five seats.
This way of thinking is based on the avowed philosophy that a candidate must be elected, if achieving an elective quota, no matter how much other voters may dislike him.

Binomial STV has a different slant on the matter. But, an exclusion quota is not of itself a veto in any one count. Neither does an election quota for a candidate offer complete assurance of election. What matters is the over-all result that averages more than one count. Binomial STV is a statistical repesentation.

Most simply, a candidate may be elected on an election count but be effectively unelected on an exclusion count. It is the average of these two counts that finally counts - (or indeed, not here discussed, the average of two averaged counts in second order Binomial STV). On the other hand, that means that a large enough popularity can out-weigh even a quota of unpopularity.

Admittedly, too great a variation of a candidates keep value from the elective value of unity may make it statisticly unrealistic to suppose that a safely elected candidate or a too little supported candidate can have those decisions reversed to, respectively, unelect or elect him.

In table 2, column 3, as there are no more votes to transfer, the keep values are calculated from the quota divided by the highest votes each candidate received. Three candidates, with keep values, of one or less, are elected out of the five vacancies. But an exclusion vote, significiantly over the quota (which means an exclusion keep value much below unity) might be enough to unelect a candidate.

Table 2 shows three candidates, A, K, O elected -- safely, it will transpire, after the exclusion count, in table 3.

Binomial STV exclusion count

Table of contents

Table 3, for the exclusion count, follows table 1, in reverse, from right to left, for next least prefered candidates. In the extreme right column, candidates S and G, each with 2 last preferences, are into the exclusion quota, which (like the election quota) is 1.667. S and G surpluses of least preference are transfered to next least prefered candidates. The transfer values just happen to be, again, 0.166. Hence, on perm 6, S transfers to R. On perm 10, S transfers to Q. On perm 5, G transfers to J. On perm 7, G transfers to E.

But no further candidate reaches an exclusion quota. Then, the exclusion keep values are calculated.

Table 3:
STV Exclusion Quota = 10/(5+1) = 1.667.

Cand-idate	(1) Last prefs. exclude G, S.	(2) Transfer exclus-ion surplus of G, S, @ 0.166	(3) Exclus-ion keep values @ quota/ (total transfer-able vote)
A			
B			
C			
D			
E	1	1.166	1.430
F	1	1	1.667
G	2	1.667	0.833
H	1	1	1.667
I			
J		0.166	10.042
K			
L			
M	1	1	1.667
N			
O			
P			
Q	1	1.166	1.430
R		0.166	10.042
S	2	1.667	0.833
T			
U	1	1	1.667

NOTA			
Votes	10	10	

In table 3, of the exclusion count, candidates G and S have quotas of below unity. They are in the exclusion zone, and it will transpire, after the overall keep value result (shown in table 4), that they are among the unelected.

Over-all candidate keep values

Table of contents

The exclusion keep values, in table 3, are inverted, to give an alternative statistic of election keep values. These inverted exclusion keep values can be averaged with the election keep values, using the geometric mean, to give over-all keep values for the candidates, to finally determine which five candidates are elected.

In other words, the exclusion keep values are inverted to make them effective election keep values. These can then be multiplied by the election keep values, which, when their square roots are taken, produce average elective keep values for the candidates, determining the winners or finally elected candidates.
(There are different kinds of average to best represent different distributions of data and the average used here is called the geometric mean.)

Averaged keep values aim to be more representative of the candidates support.

Table 4: Keep values

Cand-ate	(1) Election keep values	(2) Inverse exclus -ion keep values	(3) Over-all keep values: √{(1)x(2)}
A	0.833		<0.833 elected
B	1.430		<1.430 electted
C			
D			
E	10.042	0.699	√7.02 = 2.65
F	10.042	0.6	√6,025 = 2.45
G	1.430	1.2	√1.716 = 1.31
H	1.430	0.6	√0.858 = 0.926
I			
J		0.1	
K	0.833		<0.833 elected
L	1.667		<1.667 elected
M	10.042	0.6	√6.025 = 2.45
N			
O	0.833		<0.833 elected
P			
Q		0.699	
R		0.1	
S		1.2	
T			
U		0.6	
NOTA			

The over--all keep values elect A, K, O, at less than (<) 0.833, and next elect B and L. (I said H instead of L (in my book, FAB STV:...) but I now believe that a formal mistake. It is true that H has an over-all keep value below unity, and is therefore formally entitled to be elected. Indeed, the binomial STV election rules might allow for H to be elected to a sixth seat, one more than the election intended.

Statistically, of course, the differences, in this example, are meaningless. Statistics measures averages of distributions and the variations from the average in the distribution. To fill out a distribution, such as the binomial distribution, would require at least 30 voters.
But we are using this example to explain the formal procedure, for any election.

(I have rounded off the decimal places a bit differently, showing slightly different working, in my FAB STV book. So, this shows how easy it is for unwanted discrepancies, in the result, to creep in.
It is perhaps worth mentioning, that a computer election count requires floating point arithmetic, not to be confined to any one number base, even tho New Zealand Meek method doesn't bother to depart from decimal point arithmetic.)

Keep value determinacy rule

Table of contents

Many of the candidates, in this diminutive election did not have determinate keep values. This is a lack of formality. For elections of a statistically significant size, say 100 voters, all the candidates are likely to have at least one vote, so that it would not be necessary to artificially create determinate keep values for all candidates. However, it is possible to provide for determinate keep values, to ensure all the candidates have a definate keep value. Then there would be no blanks, in the ccount tables, for the keep values of some candidates.

A possible binomial STV rule would be that every candidate has one vote each, to start off with: This is their own vote, in effect. But the election count and the exclusion count, are symmetrical, so every candidate must be assigned one vote counted against them. That one exclusion vote may be the vote of any other candidate, seeking election in preference to that candidate.

That determinacy rule means that every candidate would have a minimum total transferable vote of one, either for election or exclusion. It follows that their minimum election keep value or exclusion keep value would be equal to the size of the quota.

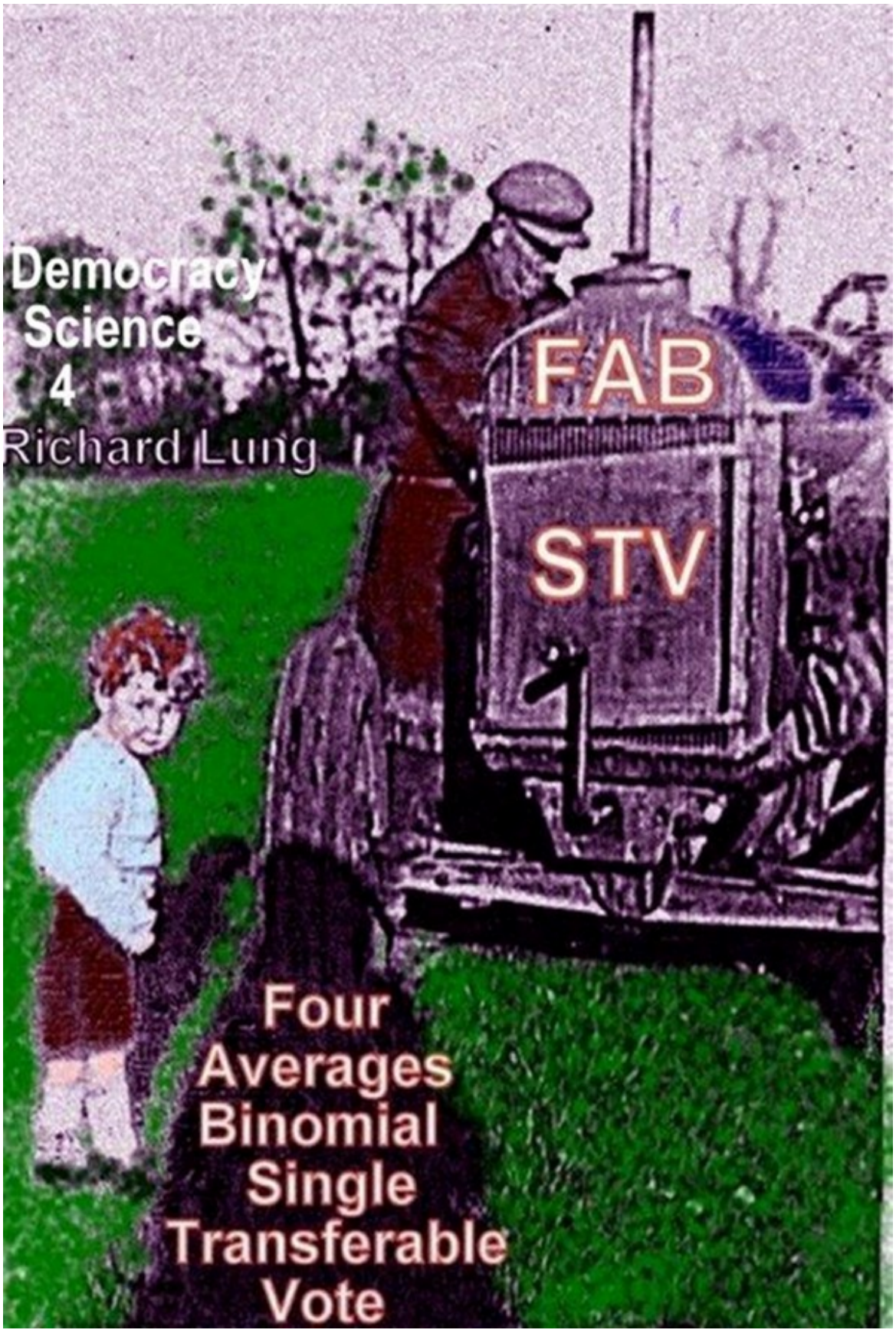
For small-scale elections, of less than a hundred voters, it might be expedient to set a minimum total transferable vote, less than unity, say one tenth of a vote, 0,1, just to give determinate keep values for all the candidates. With experience in conducting these binomial elections, more precise estimates, of a minimum total transferable vote, may be arrived at.

In any event, all the candidates are treated equally, and proportionately.

Reference:

FAB STV: Four Averages Binomial Single Transferable Vote

Table of contents


Democracy
Science
4
Richard Lung
FAB
STV
Four
Averages
Binomial
Single
Transferable
Vote

Author profile page:

https://www.smashwords.com/profile/view/democracyscience